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ABSTRACT

This report documents the evaluation of the Bilingual Mathematics and Science Achievement Program (Project BMSA) for students of limited English proficiency. The bilingual program was designed to provide intensive mathematics and science instruction, using mastery level concepts, in the native language and to incorporate mathematics and science concepts and themes into English language classes. The project provided training for teachers of students of limited English proficiency by offering workshops in science and mathematics and developed curriculum materials for both subjects. To evaluate the program, OREA interviewed project coordinators, observed a science workshop, and collected data on participants' ratings of the workshops. This document summarizes the results of an evaluation of the staff development aspect of the program. The peer teaching aspect of the program (Project SUMA) is briefly mentioned. A brief overview and history of the program, a summary of the evaluation methodology, and a summary of the evaluation findings of the evaluation of the mathematics and science comonents are presented. (KR)

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OREA Report

EVALUATION SECTION REPORT

BILINGUAL MATHEMATICS AND SCIENCE ACHIEVEMEN

1988-89

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EVALUATION SECTION
John E. Schoener, Chief Administrator
April 1990

EVALUATION SECTION REPORT

BILINGUAL MATHEMATICS AND SCIENCE ACHIEVEMENT

1988-89

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BILINGUAL MATHEMATICS AND SCIENCE ACHIEVEMENT
(PROJECT B.M.S.A.)
1988-89

SUMMARY

- The Bilingual Mathematics and Science Achievement project was fully implemented. During the 1988-89 school year, the project provided staff development activities in mathematics and science for bilingual teachers. It also created science centers, implemented a peer tutoring program in mathematics, and developed curriculum materials for both mathematics and science.

- The project met the objectives in staff development for both mathematics and science and the peer tutoring objective.

The New York City Board of Education funded the Bilingual Mathematics and Science Achievement program (Project B.M.S.A.) for its first year of implementation. The project provided training for over 900 teachers of students of limited English proficiency (LEP) by offering workshops in science and mathematics and developed curriculum materials for both subjects. Its mathematics component had a peer tutoring program, on which the Office of Research, Evaluation, and Assessment (OREA) has prepared a separate evaluation report. It also developed Bilingual Science Technical Assistance Centers (BI-STACs).

To evaluate the program, OREA interviewed project coordinators, observed a science workshop, and collected data on participants' ratings of the workshops. The program achieved the staff development and peer tutoring objectives.

The positive aspects of the program included the hands-on approach to teaching science and mathematics, the promising features of the peer tutoring program, and the practical value of the BI-STACs.

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I. INTRODUCTION

This report documents the Office of Research, Evaluation, and Assessment's (OREA's) evaluation of the New York City Board of Education-funded program, Bilingual Mathematics and Science Achievement (Project B.M.S.A.) for students of limited English proficiency (LEP students). The project, administered by the Division of Multilingual/Multicultural Education (DOMME) of the New York City Board of Education, completed its first year of operation. Its primary goal was to provide intensive mathematics and science instruction, using mastery level concepts, in the native language and to incorporate mathematics and science concepts and themes into English language classes.

One of the components of Project B.M.S.A. was peer tutoring. Under the title of Students Upgrading Mathematical Achievement (Project SUMA), this component was the object of a separate evaluation by OREA. Project SUMA's primary objective was to provide remedial tutoring to students lacking mathematical skills and enrichment to students who were potentially gifted in mathematics.

HISTORY OF THE PROGRAM

Growing evidence has indicated that students at all levels, particularly LEP students, fail to acquire basic competency in mathematics and science. According to official statistics, language-minority students of all national backgrounds frequently fail to pass the Regents Competency Tests (R.C.T.s) in mathematics and the sciences. Research studies have indicated

that teachers, particularly at the elementary and junior high school levels, who increase their competency in science and mathematics, overcome their negative feelings towards these subjects. As a result, they improve their teaching skills and their students' learning.

SETTING

Science centers were established in Manhattan, the Bronx, and Brooklyn. Staff development workshops took place in the Manhattan, the Bronx, Brooklyn, and Queens.

PARTICIPANTS

Some 870 teachers from all over the city participated in the staff development component of the project. The project highly recommended participation in the mathematics workshops to new bilingual teachers, but encouraged participation of all teachers of LEP students.

STAFF

The proposal called for a bilingual supervisor, four teachers, one office aide, and four teacher aides. The bilingual supervisor was to act as the director of the mathematics component, but he was given other responsibilities outside the project and the project supervisor assumed his duties. The project supervisor was responsibile for the overall coordination of the project, the recruitment of participants, and the hiring of consultants. One of the four teachers acted as the coordinator of the science component. Her duties included

setting up the science centers, conducting staff development activities, and providing support services. A bilingual paraprofessional served at each of the centers.

DELIVERY OF SERVICES

The program provided training in mathematics and science, using lectures, hands-on activities, discussions, and topical written materials.

REPORT FORMAT

This report is organized as follows: Chapter II describes the evaluation methodology; Chapter III presents an analysis of the findings of the evaluation; Chapter IV offers conclusions based upon the results of the evaluation.

II. EVALUATION METHODOLOGY

EVALUATION QUESTIONS

The evaluation assessed program implementation. Evaluation questions included the following:

- Were Bilingual Science Technical Assistance Centers (BI-STACS) established as planned?
- Did the program provide workshops at the BI-STACS?
- Did the program conduct training on the Elementary Science Program Evaluation Test (ESPET)?
- Did the program provide a staff development program in mathematics?
- Did the program review and evaluate bilingual materials?
- Did the program design bilingual materials in science and mathematics?

EVALUATION PROCEDURES

Sample

An OREA field consultant interviewed the project supervisor, the science coordinator, and the former mathematics supervisor. She also observed a science workshop at the BI-STAC in P.S. 128 in Manhattan. The project returned 351 completed mathematics workshops' evaluation surveys in the fall and 554 in the spring.

Instruments

OREA developed interview and observation schedules. Project personnel used an OREA-developed survey to assess participants' evaluations of workshops they had attended. The survey consisted of a four-point Likert-type rating scale of eight statements about objectives, organization, job-relatedness, the presenter,

the materials, and an overall assessment. Possible answers ranged from "excellent" to "poor." Surveys also included three open-ended questions which queried participants about the strongest feature of the workshop, suggestions for future workshops, and comments.

Data Collection and Analysis

Interviews were conducted and observations made during the month of March. OREA collected the evaluation surveys at the end of the school year. Data analysts performed frequency distributions of each of the Likert-type items.

III. EVALUATION FINDINGS

MATHEMATICS COMPONENT

The mathematics component included peer tutoring and staff development.

Peer Tutoring

A final evaluation report on the peer tutoring component, Project SUMA, gives a detailed description of its activities. The project met the objective that it would establish the bilingual peer tutoring program in at least two schools.

Staff Development

The program objective for staff development was:

- To provide over 500 teachers with a staff development program in the area of mathematics.

The project designed the staff development component to assist bilingual, English as a Second Language (E.S.L.), and monolingual teachers of LEP students with mathematics instruction. The project offered four series of workshops, two in the fall and two in the spring semester. Each series consisted of four sessions, each session was three hours long. Topics included teaching mathematics problem-solving, instructional use of computers, teaching mathematics through language arts, using manipulatives in the teaching of mathematics, integrating E.S.L. and mathematics instruction, hands-on teaching of mathematics, methodology in the teaching of mathematics, state requirements for mathematics, PEP test and syllabus, understanding children's

mathematical thinking (the roles of language and culture, context connection), mathematics and language, meaningful learning, and practical mathematics.

Fall workshops took place during October, November, and December at Aviation High School in Queens and Brooklyn Technical High School. Spring workshops took place during February, March, and April at Martin Luther King, Jr., High School in Manhattan and at P.S. 105 in the Bronx.

Limitations to the effectiveness of this kind of training included the difficulty of having to attend a three-hour session that required as much as one hour of travel time after a full workday.

Workshop Evaluation. OREA evaluated fall and spring workshops separately. Project B.M.S.A returned 313 completed evaluation surveys in the fall. Judgments were overwhelmingly positive. Sixty-nine percent of the participants gave the workshops an overall rating of excellent, 26 percent rated them as good, and less than three percent considered them fair or poor. At least 95 percent of the participants gave a rating of excellent or good to the following items: clarity of objectives, achievement of objectives, organization of the workshop, presenter's knowledge, and presenter's effectiveness.

Common answers among the 108 teachers who identified the most important feature of the workshops were their practical use (28 percent), the materials/handouts (25 percent), and the approach to the topic (19 percent). Fifty-three percent of

teachers offering recommendations suggested more workshops; 21 percent wanted more materials.

The project submitted 554 completed evaluation surveys in the spring. Sixty-five percent considered that the workshops deserved an overall rating of excellent, 24 percent assessed them as good, and only five percent considered them fair or poor. A minimum of 95 percent of the participants rated the following categories as being either excellent or good: clarity of objectives, organization of the workshop, and presenter's knowledge.

Project B.M.S.A. served over 867 participants citywide, well above the intended 500. It met the mathematics staff development objective.

SCIENCE COMPONENT

The science component included the creation of BI-STACS, staff development, and the initiation of the Bi-Tech Science/Math newsletter. The newsletter disseminated information on the latest educational developments in science and mathematics.

The project proposed to develop problem-solving and inquiry skills for this component using a hands-on approach. The workshops pursued two basic objectives: to improve science instruction in the native language and in E.S.L., and to conduct training in the Elementary Science Program Evaluation Test (ESPET), a newly implemented test for fourth grade students.

Bilingual Science Technical Assistance Centers Staff Development

The program objective for BI-STACs was:

- To provide training to 60-80 teachers at each of the Bilingual Technical Assistance Centers (BI-STACS), to improve science instruction in the native language and English as a Second Language (E.S.L.).

BI-STACS were resource centers for teachers and were furnished with books, journals, and various materials and laboratory equipment for science and mathematics experiments. They provided technical assistance, encouraged the use of science and mathematics, and trained teachers to facilitate the learning of these subjects by making students aware of their use in day-to-day living. A paraprofessional staffed each center, providing orientation and performing other tasks.

The project opened and fully implemented a BI-STAC at P.S. 128 in Manhattan and one at I.S. 184 in the Bronx. Because of structural problems at I.S. 291 in Brooklyn, the planned BI-STAC was unable to open during the year under review. Similarly, the project could not open the BI-STAC in Queens.

The utilization statistics for the two fully-operating BI-STACs show that they served a total of 1,859 people, distributed in the following way: 1,139 elementary and junior high school teachers, 166 parents, and over 500 teachers visitors. Project staff provided workshops designed to improve science instruction in the native language. Topics included: how to encourage science and mathematics learning at home, problem solving, and consumer behavior, among others. The

science coordinator also provided workshops at schools by request.

An OREA field consultant attended one of the science workshops at P.S. 128. There were 14 participants from four Community School Districts (C.S.D.s) present. In an activity on one-way communication, a single participant followed verbal instructions on how to set up some colored geometric figures. This participant could neither ask for an explanation or a reformulation of the instructions but only say "repeat." After the experiment, the instructors made an analysis of the multiple benefits students could derive from an experience such as this: the learning of shapes, colors, and concepts such as "left," "upside down," "reverse," and "opposite;" the understanding of cooperation and of listening skills; an end to the perception of science as a reading lesson; and, finally, the use of science as motivation for reading, writing, mathematics, and art. Project staff distributed handouts with suggestions for additional in-class activities.

At the end of the workshop, participants offered oral feedback to the presenters. All feedback was positive and dealt with the materials used ("I can use things that I have available"), the approach ("Children will not even think that this is science," and "This is too much fun to be science"), or with the need for further training of this kind ("What we really need is more workshops like this one"). The project met the BI-STAC objective.

Elementary Science Program Evaluation Test Staff Development

The objective for staff development was:

- To conduct training on the Elementary Science Program Evaluation Test (ESPET).

The project director actively participated in regional training workshops on the administration and scoring of the Elementary Science Program Evaluation Test (ESPET). Science teachers were particularly enthusiastic about this, because they felt that it would correct weak areas and ensure their ability to provide students with quality experiences in elementary science. Project BI-STAC achieved the objective in training on the ESPET.

CURRICULUM DEVELOPMENT

The project undertook several activities in the area of curriculum development. It identified, reviewed, and listed bilingual materials; evaluated materials developed by the C.S.D.s; and designed bilingual materials (lesson plans, syllabi, glossaries, course outlines) for use by trainers and teachers.

NEEDS ASSESSMENT SURVEY

Staff members felt that the workshops would be more useful if they responded to teachers' needs. Therefore, B.M.S.A. designed a checklist on topics a teacher should know about mathematics and science and sent over 700 questionnaires to be completed by teachers at several C.S.D.s. About 80 percent of the questionnaires were returned. The project intends to plan next year's workshops on the basis of these questionnaires.

IV. CONCLUSIONS

In its first year of operation, the Bilingual Mathematics and Science Achievement program achieved a high level of success in implementing its primary goal: to provide intensive mathematics and science instruction to teachers.

Project B.M.S.A. met the staff development objectives for its two components, as well as the peer tutoring objective for the mathematics component. It also implemented and made two Bilingual Technical Assistance Centers fully operational. These were designed to serve as resource centers for teachers.

Project B.M.S.A. was successful in providing workshops that enhanced the understanding of science and mathematics among teachers of LEP students. Participants rated the workshops positively and considered their practicality to be one of their most important features.

The positive aspects of the program included the hands-on approach to teaching science and mathematics, the promising features of the peer tutoring program, and the practical value of the BI-STACs.

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